(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 851 199 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
01.07.1998 Bulletin 1998/27

(51) Int. Cl.[6]: **F28D 9/00**, F28F 9/00, F28F 13/00

(21) Application number: **97203493.8**

(22) Date of filing: **10.11.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **23.12.1996 IT MI960847 U**

(71) Applicant: **Recuperator S.r.l.**
20121 Milano (IT)

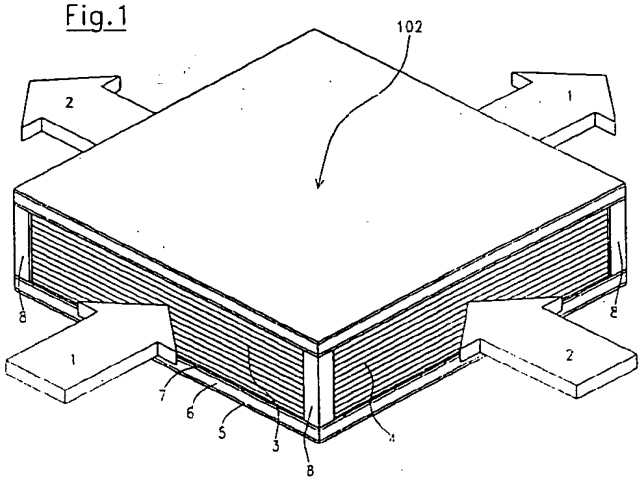
(72) Inventor: **Grilli, Ciro**
20154 Milano (IT)

(74) Representative: **Mittler, Enrico**
c/o Mittler & C. s.r.l.,
Viale Lombardia, 20
20131 Milano (IT)

(54) Heat exchanger

(57) A heat exchanger is composed of a pack of thin metal sheets (100) laid one upon the other and spaced, each comprising two pairs of opposite sides (3, 4) and coupled alternatively to the adjacent sheets in correspondence of the first (3) and of the second (4) pair of opposite sides, of two covering panels (102) for the pack of sheets and of corner ribs (8) providing for the connection of the panels. Each covering panel is soft and partially flexible, and it consists essentially of a layer of non-conductive material (6).

Fig.1



EP 0 851 199 A2

Description

The present invention refers to a heat exchanger, in particular an air-to-air heat exchanger of the type with a pack of metal plates.

There are known heat exchangers of the plate pack type comprising a pile of metallic sheets, preferably of aluminium, substantially with a rectangular shape, as the one described in French patent 2 318 389. The various aluminium sheets are welded to each other in correspondence of a pair of opposite sides, in such a way so that the two flows of air, that must exchange heat with each other, are directed orthogonally to each other.

The pack of sheets is sealed in correspondence of the corners by means of corner ribs that, in turn, connect a pair of metal panels, parallel to the aforementioned aluminium sheets, that act as refinishing.

In these exchangers there occurs a problem consisting in that, because of the thermal exchange, a condensate is formed on the inside and outside walls of the panels. The one on the inside walls is absorbed by the system of feed and air recovery. The one on the outside walls, instead, produces a dripping, in particular if the exchanger has the panels arranged in vertical position.

In view of the described state of the art, object of the following invention is to provide for a heat exchanger of the type described, that instead is not subject to problems with condensate.

According to the following invention, such object is achieved by means of a heat exchanger composed of a pack of metal sheets laid one upon the other and spaced, each including two pairs of opposite sides and coupled alternatively to the adjacent sheets in correspondence of the first and of the second pair of opposite sides, of two covering panels for the sheet pack and of corner ribs for the connection of the panels, characterised in that each covering panel is soft and partially flexible, and it is essentially made of a layer of non-conductive material.

Thanks to the present invention, the inside faces of the covering panels result to be thermally insulated with respect to the exchanger, and therefore do not present problems with the formation of condensate.

In addition the fact to employ covering panels of the type claimed allows to use sheets of non-conductive material, either with or without one or two layers of coating, currently available on the market, that can then be cut into the proper dimensions.

These and other characteristics and advantages of the present invention will be rendered more evident by means of the following detailed description of an embodiment, illustrated as a non restrictive example in the attached drawings, where:

Fig. 1 is an axonometric schematic view of a heat exchanger according to the invention;

Fig. 2 is a section of Fig. 1 along a plane parallel to the covering panels (trace line II-II of Fig. 4);

Fig. 3 is a section of the heat exchanger according to line III-III of Fig. 2;

Fig. 4 is the section of the heat exchanger according to line IV-IV of Fig. 2.

With reference to the above mentioned Figures and in particular to Fig. 1, there is shown an air-to-air heat exchanger according to the present invention. The heat exchanger comprises a plurality of metal sheets 100 laid one upon the other, preferably of aluminium, which, as shown in Figures 2-4, have a plurality of bulges 101 serving the purpose to maintain the sheets themselves at a desired distance and to increase the surface useful to the exchange of heat; always referring to Figures 2-4, the sheets 100 comprise two pairs of opposite sides 3 and 4 and they are coupled alternatively to the adjacent sheets in correspondence of the first and of the second pair of opposite sides. In this way there is the creation of a first plurality of channels defined by the welding zones between the pairs of sides 3 of the adjacent sheets for a first air flow 1 (Fig. 1), alternated with a second plurality of channels defined by the welding zones between the pairs of side 4 and that extend in a direction orthogonal to that of the channels of the first plurality for a second air flow 2.

As shown in Figures 1, 3 and 4, the heat exchanger is refinished by means of two covering panels 102 and four corner ribs 8, which have also the function of fastening the metal sheets 100 and the panels 102 to each other. In the example shown by the drawings, each covering panel is composed of three layers 5, 6 and 7: the outside layers 5 and 7 consist of two thin metal sheets, preferably of aluminium, having a certain degree of flexibility. The intermediate layer 6 is a layer of non-conductive material that serves the purpose to insulate thermally the exterior of the heat exchanger (in this case the layers 5 of the two panels 102) from the inside of the same, as to avoid the formation of condensate. The function of layers 5 and 7 is essentially aesthetic, therefore they could also not be provided: in this case each panel 102 will consist of the sole non-conductive material 6. As an alternative, the layer 6 can be coated only on one side, instead of both, either on the external or on the internal side.

Claims

1. Heat exchanger consisting of a pack of metal sheets (100) laid one upon the other and spaced, each including two pairs of opposite sides (3, 4) and coupled alternatively to the adjacent sheets in correspondence of the first (3) and of the second pair (4) of opposite sides, of two covering panels (102) for the pack of sheet and of corner ribs (8) for the connection of the panels, characterised in that each covering panel is soil and partially flexible, and is essentially made of a layer of non-conductive material (6).

2. Heat exchanger according to claim 1. characterised in that each covering panel (102) comprises, besides said layer of non-conductive material (6), at least one coating layer (5, 7) for the internal and/or external surface of said covering panel.

3. Heat exchanger according to claim 2, characterised in that at least one coating layer (5, 7) is a layer of aluminium.

4. Heat exchanger according to any one of the previous claims, characterised in that said covering panels (102) are obtained by cutting, according to the desired dimensions, sheets of non-conductive material, either with or without one or two layers of coating, available on the market.

Fig.1

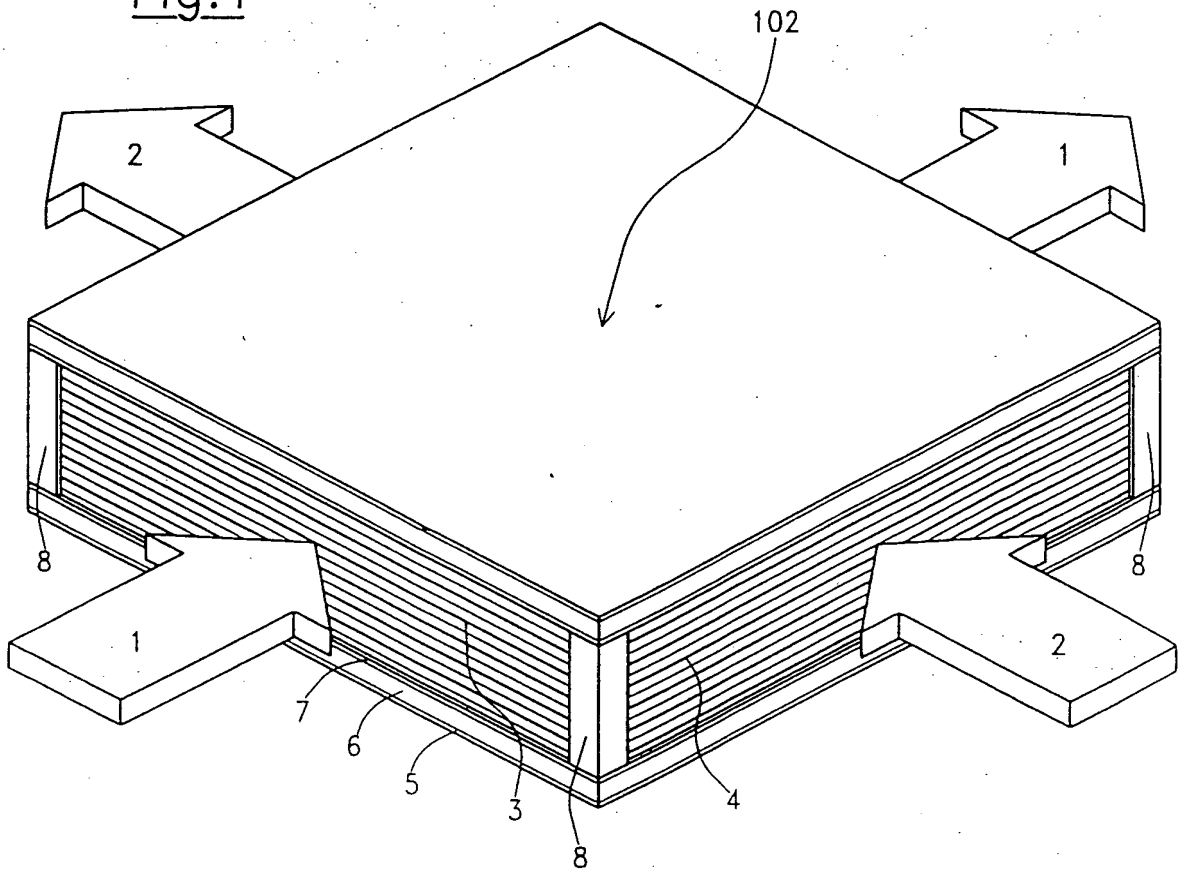


Fig.3

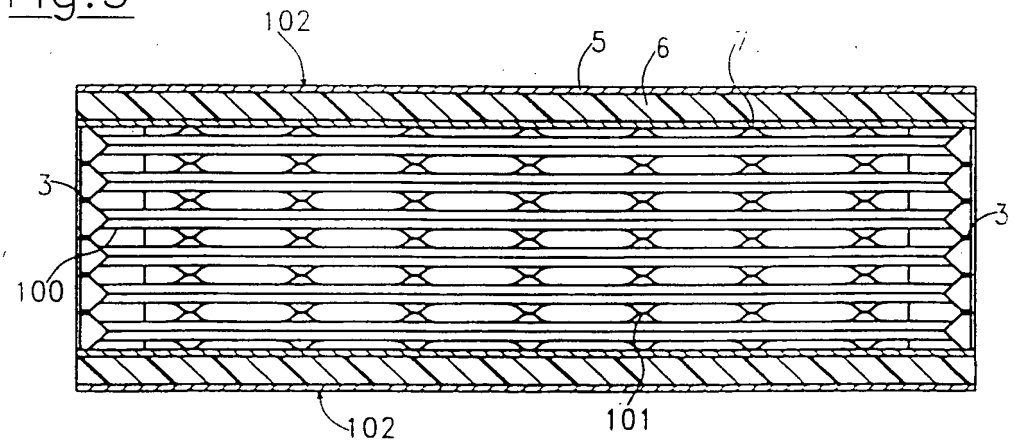


Fig.2

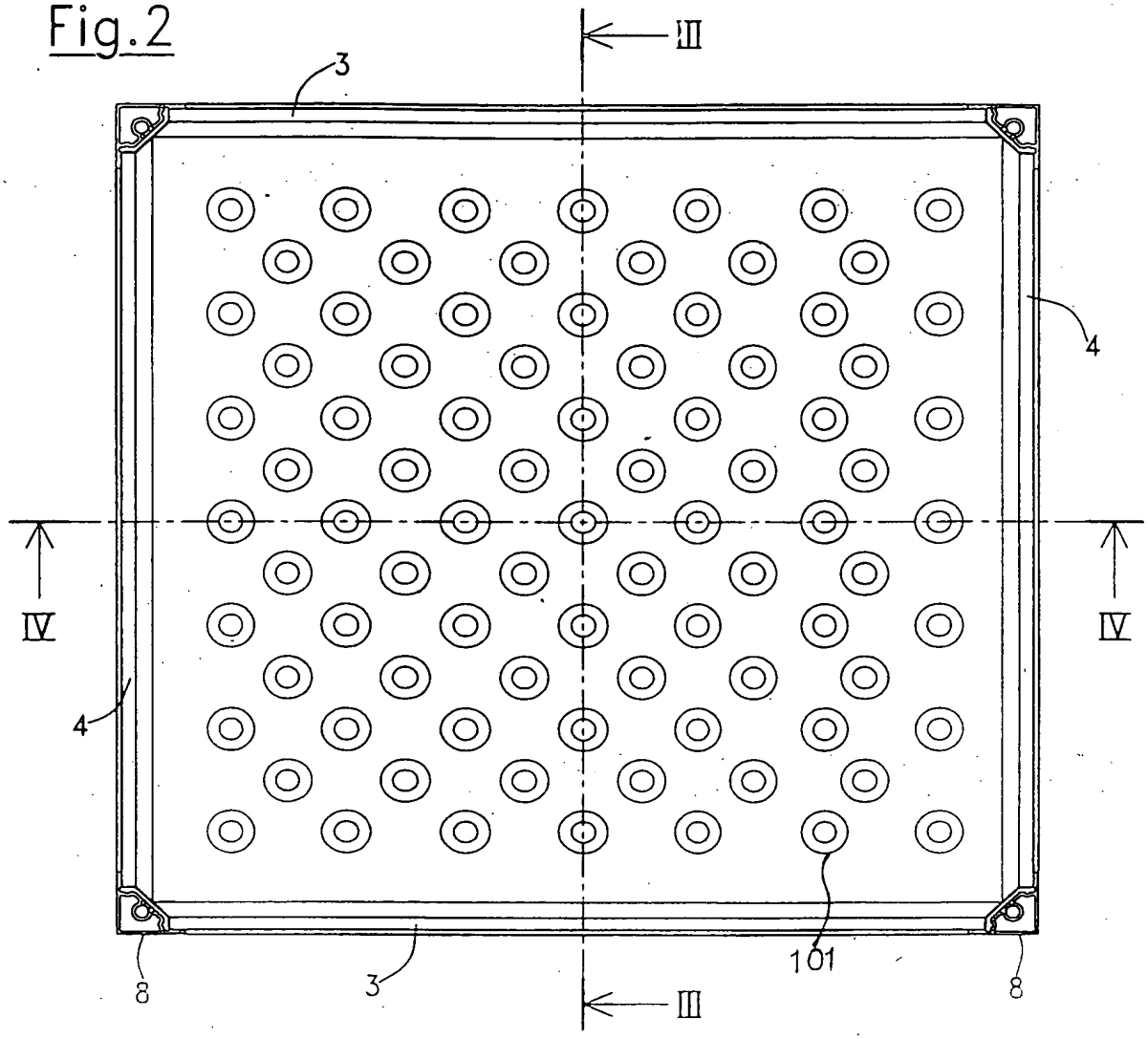


Fig.4